CLAIMS

1. Process for mixing a first acidic aqueous solution comprising hydroxylammonium and phosphate with a second acidic aqueous solution comprising nitric acid, resulting in a third acidic aqueous solution comprising hydroxylammonium, phosphate and nitric acid, wherein in the third acidic aqueous solution the total acid concentration minus the phosphate concentration is lower than $0.523 * \ln([\text{hydroxylammonium}]/1.25) + 422/(T + 81)$ whereby [hydroxylammonium] is the concentration of hydroxylammonium in the third acidic aqueous solution, T is the temperature of the third acidic aqueous solution expressed in °C and all concentrations are expressed in mol/l.

2. Process according to claim 1, wherein

$$(c_{acid}(1)*V_1 + c_{acid}(2)*V_2)/(V_1+V_2) - (c_{phosphate}(1)*V_1 + c_{phosphate}(2)*V_2)/(V_1+V_2) < 0.523 * \ln(((c_{hyam}(1)*V_1 + c_{hyam}(2)*V_2)/(V_1+V_2))/1.25) + 422/(T(3) + 81)$$

wherein

$c_{acid}(1)$ and $c_{acid}(2)$ are the total acid concentration in the first acidic aqueous solution and in the second acidic aqueous solution respectively, expressed in mol/l.

$c_{phosphate}(1)$ and $c_{phosphate}(2)$ are the phosphate concenration in the first acidic aqueous solution and in the second acidic aqueous solution respectively, expressed in mol/l.

$c_{hyam}(1)$ and $c_{haym}(2)$ are concentration hydroxylammonium in the first acidic aqueous solution and in the second acidic aqueous solution respectively, expressed in mol/l.

T(3) is the temperature of the third acidic aqueous solution.

V_1 and V_2 are the volume of the first acidic aqueous solution and second acidic aqueous solution respectively.

3. Process according to claim 1 or claim 2, wherein the process comprises adding hydroxylammonium to an acidic aqueous solution comprising hydroxylammonium to obtain the first acidic aqueous solution.

4. Process according to claim 3, wherein the acidic aqueous solution to which hydroxylammonium is added is an aqueous reaction medium leaving a cyclohexanone oxime synthesis reactor in which cyclohexanone oxime is produced by reaction of hydroxylammonium with cyclohexanone.

5. Process according to claim 4, wherein the aqueous reaction medium leaving the cyclohexanone oxime synthesis reactor is separated into at least a first part and a

second part; and wherein the process comprises adding said hydroxylammonium to the first part of the aqueous reaction medium to obtain the first acidic aqueous solution; and absorbing and/or oxidizing nitrogen oxides in the second part of the aqueous reaction medium to prepare nitric acid.

6. Process according to any one of claims 1 to 5, wherein the process comprises adding hydroxylammonium to the third acidic aqueous solution.

7. Process according to any one of claims 3 to 6, wherein an aqueous reaction medium leaving a hydroxylammonium synthesis reactor is used to add said hydroxylammonium to said acidic aqueous solution.

8. Process according to any one of claims 1 to 7, wherein the process comprises feeding the third acidic aqueous solution to a hydroxylammonium synthesis reactor in which hydroxylammonium is prepared by catalytic reduction of nitrate with hydrogen.

9. Process according to any one of claims 1 to 8, wherein the third acidic aqueous solution is mixed with an acidic aqueous solution comprising nitric acid, said mixing preferably being carried out at a temperature between 20 and 80 °C, resulting in a fourth acidic aqueous solution comprising hydroxylammonium, phosphate and nitric acid wherein

$c_{acid}(4)-c_{phosphate}(4) < 0.523*\ln(c_{hyam}(4)/1.25) + 422/(T(4) + 81)$ wherein

$c_{acid}(4)$ = total acid concentration in the fourth acidic aqueous solution, expressed in mol/l

$c_{phosphate}(4)$ = phosphate concentration in the fourth acidic aqueous solution, expressed in mol/l

$c_{hyam}(4)$ = concentration hydroxylammonium in the fourth acidic aqueous solution, expressed in mol/l

T(4) = temperature in the fourth acidic aqueous solution expressed in °C.

10. Process according to claim 9, wherein the process comprises feeding the fourth acidic aqueous solution to a hydroxylammonium synthesis reactor in which hydroxylammonium is prepared by catalytic reduction of nitrate with hydrogen.

11. Process according to claim 9 or claim 10, wherein the process comprises adding hydroxylammonium to the third acidic aqueous solution.

12. Process according to any one of claims 1 to 11, wherein an aqueous reaction medium leaving a hydroxylammonium synthesis reactor is used to add said hydroxylammonium to the third acidic aqueous solution.

13. Process according to claim 1 or claim 2, wherein the mixing of the first acidic aqueous solution and second acidic aqueous solution is performed in a hydroxylammonium synthesis reactor in which hydroxylammonium is prepared by catalytic reduction of nitrate with hydrogen.

14. Process according to claim 9, wherein the mixing of the third acidic aqueous solution and said acidic aqueous solution comprising nitric acid is performed in a hydroxylammonium synthesis reactor in which hydroxylammonium is prepared by catalytic reduction of nitrate with hydrogen.

15. Process according to any one of claims 1 to 14, wherein the process comprises cycling an aqueous reaction medium from a hydroxylammonium synthesis reactor in which hydroxylammonium is prepared by catalytic reduction of nitrate with hydrogen to a cyclohexanone oxime synthesis reactor in which cyclohexanone oxime is produced by reaction of hydroxylammonium with cyclohexanone and from the cyclohexanone oxime synthesis reactor back to the hydroxylammonium synthesis reactor.

16. Process according to any one of claims 1 to 15, wherein an aqueous reaction medium leaving a cyclohexanone oxime synthesis reactor is used as first acidic aqueous solution.

17. Process according to any one of claims 1 to 16, wherein the second acidic aqueous solution is obtained by absorbing and oxidizing nitrogen oxides in an aqueous solution.

18. Process according to any one of claims 1 to 17, wherein said mixing of the first acidic aqueous solution with the second acidic aqueous solution is carried out at a temperature between 20 and 80 °C.